

WHAT IS CLAIMED IS:

1. A tensioner for a power transmission belt that utilizes asymmetric motion control, the tensioner comprising:

an arm comprising a belt engaging section and a drum section;

a support member for securing the tensioner relative to the belt, the arm pivoting about the support member;

a spring that urges the arm to pivot about the support member in a first direction and urges the belt engaging section against the belt with a force to tension the belt;

a stator coupled to the support member to form arcuate spaces, the arcuate spaces being circumferentially spaced around the stator between the stator and the drum section;

arcuate shaped wedges located in the arcuate spaces;

a Belleville spring coupled to the arm for pivoting therewith; and

a friction device in sliding contact with the Belleville spring and the wedges;

wherein the tensioner is operable in a first condition in which the friction device is engaged with the Belleville spring so as to pivot with the Belleville spring and the arm relative to the stator and a second condition in which the stator, wedges and friction device are locked up together and the Belleville spring and the arm pivot relative to the friction device.

2. A tensioner as claimed in 1, wherein in the first operating condition the friction device is frictionally engaged with Belleville spring so as to pivot therewith.

3. A tensioner as claimed in claim 2, wherein the tensioner operates in the first operating condition when a lifting torque exerted by the belt on the arm is less than a frictional torque between the Belleville spring and the friction device.

4. A tensioner as claimed in claim 2, wherein the tensioner operates in the second operating condition when a lifting torque exerted by the belt on the arm is greater than a frictional torque between the Belleville spring and the friction device.
5. A tensioner as claimed in claim 1, wherein in the second operating condition sliding friction between the friction device and the Belleville spring acts to resist movement of the arm in the second direction.
6. A tensioner as claimed in claim 1, wherein the arm pivots in a second direction in the second operating condition.
7. A tensioner as claimed in claim 1, wherein the tensioner operates in the first condition when the arm pivots in the first direction and wherein the tensioner operates in one of the first and second conditions when the arm pivots in a second direction.
8. A tensioner as claimed in claim 1, wherein the tensioner operates in a first friction mode when the arm pivots in the first direction and wherein the tensioner operates in one of a second and third friction modes when the arm pivots in a second direction.
9. A tensioner as claimed in claim 8, wherein a friction force produced by the tensioner to resist movement of the arm is greater in the second and third friction modes than in the first friction mode.
10. A tensioner as claimed in claim 1, wherein the stator and wedges include fluid passageways for lubrication.

11. A tensioner as claimed in claim 1, wherein each of the wedges has a wedge spring configured to generate a separating force between each of the wedges and the stator.

12. A tensioner for a power transmission belt that utilizes asymmetric motion control, the tensioner comprising:

an arm comprising a belt engaging section and a drum section;

a support member for securing the tensioner relative to the belt, the arm pivoting about the support member;

a spring that urges the arm to pivot about the support member in a first direction and urges the belt engaging section against the belt with a force to tension the belt;

a stator coupled to the support member to form arcuate spaces, the arcuate spaces being circumferentially spaced around the stator between the stator and the drum section;

arcuate shaped wedges located in the arcuate spaces;

a friction device in frictional contact with the wedges and pivotable about the support member; and

a Belleville spring coupled to the friction device for pivoting therewith, the Belleville spring also in frictional contact with the arm;

wherein the tensioner is operable in a first condition in which the Belleville spring is engaged with the arm such that the Belleville spring and friction device pivot with the arm relative to the stator and a second condition in which the stator, wedges and friction device are locked-up together and the arm pivots relative to the Belleville spring and friction device.

13. A tension as claimed in claim 12, wherein in the first operating condition the Belleville spring is frictionally engaged with the arm so as to pivot therewith.

14. A tensioner as claimed in claim 12, wherein the tensioner operates in the first operating condition when a lifting torque exerted by the belt on the arm is less than a frictional torque between the Belleville spring and the arm.
15. A tensioner as claimed in claim 12, wherein the tensioner operates in the second operating condition when a lifting torque exerted by the belt on the arm is greater than a frictional torque between the Belleville spring and the arm.
16. A tensioner as claimed in claim 12, wherein in the second operating condition sliding friction between the Belleville spring and the arm acts to resist movement of the arm in the second direction.
17. A tensioner as claimed in claim 12, wherein the arm pivots in a second direction in the second operating condition.
18. A tensioner as claimed in claim 12, wherein the tensioner operates in the first condition when the arm pivots in the first direction and wherein the tensioner operates in one of the first and second conditions when the arm pivots in a second direction.
19. A tensioner as claimed in claim 12, wherein the stator and wedges include fluid passageways for lubrication.
20. A tensioner for a power transmission belt that utilizes asymmetric motion control, the tensioner comprising:
 - an arm comprising a belt engaging section and a drum section;
 - a support member for securing the tensioner relative to the belt, the arm pivoting about the support member;

a spring that urges the arm to pivot about the support member in a first direction and urges the belt engaging section against the belt with a force to tension the belt;

a stator coupled to the support member inside the drum section of the arm to form arcuate spaces, the arcuate spaces being circumferentially spaced around the stator between the stator and the drum section;

arcuate shaped wedges located in the arcuate spaces;

a Belleville spring coupled to the arm for pivoting therewith; and

a friction device in sliding contact with the Belleville spring and the wedges;

wherein the stator and wedges include fluid passageways for lubrication.

21. A tensioner for a power transmission belt that utilizes asymmetric motion control, the tensioner comprising:

an arm comprising a belt engaging section and a drum section;

a support member for securing the tensioner relative to the belt, the arm pivoting about the support member;

a spring that urges the arm to pivot about the support member in a first direction and urges the belt engaging section against the belt with a force to tension the belt;

a stator coupled to the support member inside the drum section of the arm to form arcuate spaces, the arcuate spaces being circumferentially spaced around the stator between the stator and the drum section;

arcuate shaped wedges located in the arcuate spaces;

a friction device in frictional contact with the wedges and pivotable about the support member; and

a Belleville spring coupled to the friction device for pivoting therewith, the Belleville spring also in frictional contact with the arm;

wherein the stator and wedges include fluid passageways for lubrication.